

STRATEGIC SCIENCE AND TECHNOLOGY ITEMS

Table 1: Listed by Major R&D Program

Table 2: Listed by Science or Technology - For items which support two or more programs.

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TABLE I
STRATEGIC SCIENCE AND TECHNOLOGY ITEMS
LISTED BY MAJOR R&D PROGRAM

key: A=well developed externally
 B=emerging/developing externally
 C=no known external development

AMBROSIA

<u>Paper Coating</u> technologies	A
<u>Chemical Senses</u> - Means to mask or synergistically cancel aroma or taste.	B
<u>Encapsulation Technology</u>	B
<u>Paper-Additive Interactions</u> - Means to predict the stability of aroma compounds on paper	C
<u>Combustion Physics & Chemistry</u> - Decomposition routes & products	C
<u>Basic Research Support</u>	
Consumer Testing	
Flavors	

ART

<u>Selective Separation</u> technologies	B
<u>Simulation & Modeling</u> of ART processes	B
<u>Chemical Senses</u> - Means to simulate the "impact" of nicotine.	C
<u>Nicotine Disposal</u> technologies	B
<u>Thermodynamics and Kinetics</u> of nicotine-tobacco system	C
<u>Continuous Feed Technologies</u> - in/out of high pressure systems	C
<u>Basic Research Support</u>	

 Biological
 Computing
 Consumer Testing
 Flavors
 Separations

CAST SHEET

<u>Casting and Drying</u> technologies	A
<u>Release Compounds/Technologies</u>	B
<u>Binder Formulation</u>	C
" <u>Microbubble</u> " Technology - for modifying sheet character	C
<u>Extrusion Technologies</u> - for cast sheet	C

Basic Research Support

 Biological
 Combustion Physics & Chemistry
 Flavors

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DOMESTIC PRODUCT SUPPORT

This program area implements developed technologies which result from the other program areas.

EXPANDED PRODUCT

<u>Simulation & Modeling</u> - of two phase flow	A
<u>Machine Design</u> - maker for low density products	B
<u>Thermodynamics and Kinetics</u>	
- of CO ₂ / tobacco interactions	C
- of tobacco thermal treatment	C
- of Kabat loss during processing	C
<u>Continuous Feed Technologies</u> - in/out of pressurized systems	C
<u>Binder Technology</u>	C

Basic Research Support

Combustion Physics & Chemistry
Computing
Flavors

FILTER R&D

<u>Filter Fabrication</u> - in-house facility/expertise	A
<u>Chemical Senses</u> - identity of important flavor components	B
<u>Combustion Physics & Chemistry</u> - flavor component generation	C

Basic Research Support

Aerosols
Catalysis
Computing
Consumer Testing
Flavors
Selective Filtration

INTERNATIONAL PRODUCTS

Combustion Physics & Chemistry- methods for improving the smoking characteristics of stems C

This program area primarily implements developed technologies which result from the other program areas.

A need to support existing (older) technologies in in South American factories was expressed, but this may not be an R&D program need.

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LBA:

<u>Tumor Promotion Assays</u> - Short-term in vitro	B
<u>Cellular Detoxification and Toxicification</u>	B
<u>Macromolecular Adduct Assays</u> - DNA & protein	B
<u>Oncogene Assays</u>	B
<u>Genetic Susceptibility Markers</u> (RG genes, etc.)	B
- role of cellular messengers other biologically reactive species	B
<u>Biochemistry</u> - role of NO _x in cellular reactivity	C

Basic Research Support

 Biological
 Combustion Physics & Chemistry
 Separations

LOW TAR HIGH TASTE and
REDUCED TAR AND NICOTINE

<u>Chemical Senses</u>	B
<u>Smoke Chemistry</u> - Flavor generation mechanisms	C
<u>Filtration Mechanisms</u> - Means for selective separation of vapor phase components	C
<u>Simulation & Modeling</u> - to predict delivery of critical flavor components from cigarette parameters	C
<u>Flavor Release Technologies</u> - for releasing flavors from filters	B

Basic Research Support

 Aerosols
 Biological
 Combustion Physics & Chemistry
 Consumer Testing
 Flavors
 Separations

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OPERATIONS SUPPORT

<u>Polymer Characterization Technology</u> - Methodology for characterizing high molecular weight materials.	A
<u>Environmental Sample Processing</u> - methods, facility and in-house expertise	A
<u>Statistical Analysis/Experimental Design</u> - resident in the Analytical Research Division	A
<u>"Forensic Chemistry"</u> - expertise in determining probable causes of product problems	A
<u>Chemical Senses</u> - for relating analytical and subjective results	B
<u>Analytical Databases</u>	B

Basic Research Support

Computing
Entomology
Measurement and Sensing
Microbiology

OPTICAL PROCESSING

<u>Algorithm Concepts & Development</u>	B
<u>High Speed Processing</u> (computing) technologies	B
<u>High Speed Scanning</u> (camera) technologies	B
<u>High Speed Presentation</u> technology & hardware	C

Basic Research Support

Computing
Measurement and Sensing

PAPER/SIDESTREAM

<u>Particle Morphology Measurement/Classification</u>	B
<u>Analysis Techniques</u> - Real time analysis of sidestream smoke	B
<u>Catalysis</u> for conversion of gas phase components	B
<u>Selective Filtration</u> - objectional taste/aroma elements	C
<u>Chemical Senses</u> - subjective-analytical correlations	B
<u>Filler-Fiber Interactions</u> in papers	C

Basic Research Support

Aerosols
Combustion Physics & Chemistry
Consumer Testing
Flavors
Measurement and Sensing

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PACT

Catalysts for CO removal from ambient air
Analysis Techniques - to measure extremely low concentrations of organic vapors

Basic Research Support

Aerosols
Catalysis
Consumer Testing
Measurement and Sensing

TOMORROW

- Machine Design - maker for low density products
- Catalysis - CO reduction in low porosity product
- Simulation & Modeling - fabric ignition
 - heat generation & transmission
- Combustion Physics & Chemistry - reduced combustion
 - energy
 - heat absorbing compounds
 - insulating wrappers/
fillers
- On-Line Porosity Measurement technology
- Expanded Tobacco technology

Basic Research Support

Catalysis
Combustion Physics & Chemistry
Computing
Consumer Testing
Measurement and Sensing

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TSNA

<u>Protein Isolation and Purification</u> technology	A
<u>Genetic Engineering</u> technology	A
<u>Selective Separations</u> - solvent/co-solvent effects	B
- solubility modification	B
<u>Biochemistry</u> - biosynthetic pathways in tobacco	B
<u>Transient Expression</u> methodology	B
" <u>Scrubbing</u> " Technologies - (alkaloids from fluids)	B
<u>Combustion Physics & Chemistry</u> - Pyrosynthetic pathways	C
<u>Catalysts</u> - decomposition of TSNA's	C
<u>Denitration Technologies</u> - cut filler	C
<u>Basic Research Support</u>	
Biological	
Combustion Physics & Chemistry	
Separations	

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TABLE II
AREAS OF SCIENCE OR TECHNOLOGY IMPORTANT TO TWO OR MORE R&D MAJOR PROGRAMS

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ANALYSIS TECHNIQUES

<u>Paper/Sidestream</u> - Real time analysis of sidestream smoke	B
<u>PACK</u> - Analysis of extremely low concentrations of organic vapors	A

BINDER TECHNOLOGY

<u>Cast Sheet</u> - Binder formulation	C
<u>Expanded Product</u> - Low density product	C

CATALYSTS

<u>Paper/Sidestream</u> - Gas phase conversion	B
<u>PACK</u> - CO removal from ambient air	B
<u>Tomorrow</u> - CO reduction in low porosity product	B
<u>TSNA</u> - Decomposition of TSNA's	C

CHEMICAL SENSES

<u>Ambrosia</u> - Means to mask or synergistically cancel aroma or taste	B
<u>Filter R&D</u> - Identify important flavor components	B
<u>Low Tar High Taste</u> - Important flavor components	B
<u>Operations Support</u> - Relationship of analytical and subjective results	B
<u>Paper/Sidestream</u> - Relationship of analytical and subjective results	B
<u>ART</u> - Simulation of nicotine impact	C

COMBUSTION PHYSICS & CHEMISTRY

<u>Ambrosia</u> - Generation of taste/odor components	C
<u>Filter R&D</u> - Flavor component generation	C
<u>International Products</u> - Improved taste from stems	C
<u>Low Tar High Taste</u> - Flavor generation mechanisms	C
<u>Tomorrow</u> - Reduced combustion energy	B
- Heat absorbing compounds	B
- Insulating wrappers/fillers	B
<u>TSNA</u> - Pyrosynthetic pathways	C

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CONTINUOUS FEED TECHNOLOGIES

ART & EXPANDED PRODUCT - Tobacco movement in and out of pressurized systems C

MACHINE DESIGN

EXPANDED PRODUCT & TOMORROW - Maker for low density products B

SELECTIVE SEPARATIONS

ART - Selective extractions B
TSNA - Solvent/co-solvent effects B
- Solubility modification B

SIMULATION AND MODELING

Expanded Product - Modeling of two phase flow A
ART - Simulation of extraction process B
Tomorrow - Models of - Fabric ignition B
- Heat generation & transmission B
Low Tar High Taste - Predict delivery of flavor components C

THERMODYNAMICS & KINETICS OF CHEMICAL SYSTEMS

ART - Nicotine-tobacco system C
Expanded Product - CO-tobacco system C
- Thermal treatment of tobacco C

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